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(54) Title: RETROREFLECTIVE-COATED AUTOMOTIVE VEHICLE COMPONENTS

(57) Abstract: The present invention provides metallic and/or polymeric automotive vehicle components coated with a retroreflective outer coating deposited from a coating composition comprising one or more crosslinkable film-forming materials and a plurality of retroreflective microsphere beads. Automotive vehicle components coated with retroreflective waterborne basecoats and retroreflective solventborne basecoats applied over electrodeposited coatings are also provided.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/13967

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C09D5/00 B05D7/00 B05D5/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C09D B05D C03C G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 5 736 602 A (GEORGE L. CROCKER) 7 April 1998 (1998-04-07)</p> <p>abstract column 1, paragraph 2 column 3, line 33-51 column 5, paragraph 1 ---</p> <p style="text-align: center;">-/--</p>	<p>1,2,4,7, 9-11,13, 14,16, 28-33, 35,36</p>



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	<p>WO 00 15351 A (INNOVATIVE CONCEPTS UNLIMITED) 23 March 2000 (2000-03-23)</p> <p>page 3, paragraph 2 page 4, line 17-19 page 5, paragraphs 2,4 page 6, paragraph 3 page 9, line 20 -page 10, line 13 ---</p>	<p>1,2,4,7, 9,10, 13-20, 22,23, 26-32, 35,36</p>
A	<p>US 2 963 378 A (MINNESOTA MINING AND MANUFACTURING COMPANY) 6 December 1960 (1960-12-06) cited in the application whole document -----</p>	<p>1-36</p>

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/13967

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-36

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-36

Metallic automotive vehicle component coated with a retroreflective coating composition containing a crosslinkable film-forming polymer

2. Claims: 37-53

Polymer automotive vehicle component coated with a retroreflective coating composition containing a film-forming polymer

3. Claim : 54

Automotive vehicle component coated with a retroreflective coating composition containing a crosslinkable film-forming polymer, microbeads and reflective particles

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5736602	A	07-04-1998	NONE	

WO 0015351	A	23-03-2000	AU 5688299 A	03-04-2000

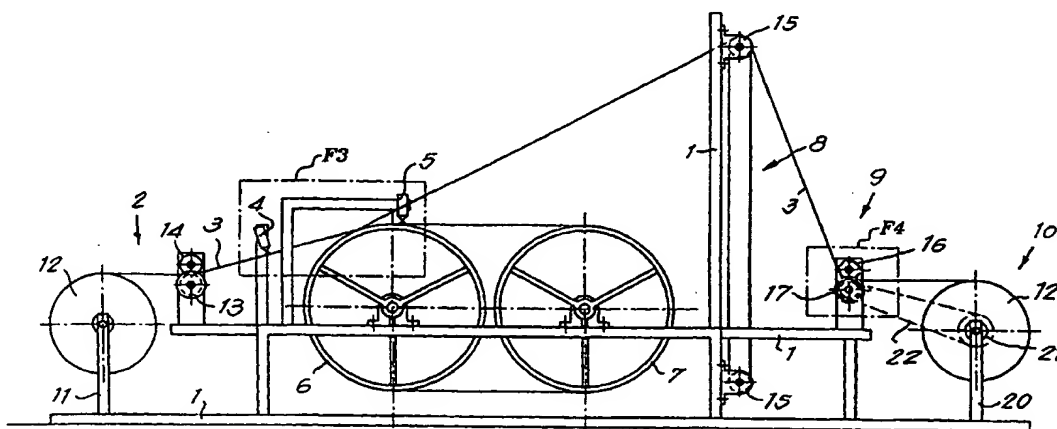
US 2963378	A	06-12-1960	NONE	



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(21) International Application Number: PCT/BE99/00159 (22) International Filing Date: 7 December 1999 (07.12.99) (30) Priority Data: 9800890 11 December 1998 (11.12.98) BE (71)(72) Applicant and Inventor: STEVENINCK, Etienne [BE/BE]; Uirweg 1, B-9800 Deinze (BE). (74) Agent: DONNE, Eddy; Bureau M.F.J. Bockstael nv, Aren- bergstraat 13, B-2000 Antwerpen (BE).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>In English translation (filed in Dutch).</i>

(54) Title: METHOD AND DEVICE FOR THE APPLICATION OF REFLECTING MATERIAL ON A SUBSTRATE

**(57) Abstract**

Method for the application of reflecting material on a substrate, in particular of a reflecting strip on a band (3), characterised in that on the place where the reflecting material is to be provided, a layer (23) of a polymer solution with at least one pigment and a second layer (24) with light-reflecting particles are applied on the substrate. The device contains two nozzles (4 and 5), means for successively moving a band (3) in relation to said two nozzles (4 and 5) and heating means for heating the band (3) beyond each nozzle (4-5).

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Method and device for the application of reflecting material on a substrate.

5

The present invention concerns a method for the application of reflecting material on a substrate, preferably a flexible substrate, in particular of a reflecting strip on a band.

10

The material can have purely reflecting qualities or reflecting qualities in combination with phosphorescent or fluorescent qualities.

15 According to known methods, a prefabricated reflecting ribbon is attached on clothes or such by means of stitching, gluing or welding.

This method is relatively time-consuming, since a
20 reflecting ribbon has to be fabricated first, after which this ribbon is to be provided on a substrate such as a garment or band.

Other known methods consist in providing reflecting
25 material on a substrate by means of transfer, for example under the influence of heat.

These methods are complicated and time-consuming as well, since the material to be transferred has to be provided on
30 a substrate first, after which this material has to be provided on the eventual substrate by means of transfer. This usually requires a relatively expensive machine and a special composition of the material to be transferred. Moreover, the first substrate upon which the material to be

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transferred has been provided constitutes a relatively large amount of waste.

5 The invention aims to avoid these disadvantages and to provide a method for applying reflecting material on a band which is relatively simple, fast and flexible.

10 This aim is reached according to the invention in that on the place where the reflecting material is to be provided, a layer of a polymer solution with at least one pigment and a second layer with light-reflecting particles are applied on the substrate.

15 Preferably, the second layer is provided in a liquid form after the first layer has dried.

20 According to a special embodiment, after this second layer has dried, the two layers are levelled under pressure as a whole.

The substrate is preferably a band, in particular a fabric, and the reflecting material is provided on it as a strip.

25 The two layers can be levelled by calendering the substrate and the layers as a whole.

30 This calendering preferably takes place between two rollers, whereby the roller situated on the side of the layers is driven at a higher peripheral velocity than the other one.

In order to accelerate the drying of an applied layer, this layer can be heated. If the first layer is heated, this layer is preferably cooled before the second one is

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provided. When the second layer is heated before it is dried, it is preferably cooled before it is levelled.

5 The first layer may be an acrylic polyurethane or an acrylic vinyl acetate on an aqueous base onto which pigment has been added, and the second layer may be a transparent layer consisting of a resin with reflecting particles added to it, in particular glass beads.

10 The invention also concerns a device which is suitable for applying the method according to any of the preceding embodiments on band-shaped substrates.

15 The invention thus concerns a device for applying a strip of reflecting material on a band, which device contains two liquid supply systems, means for successively moving a band in relation to said two liquid supply systems and heating means for heating the band beyond each liquid supply system.

20 Practically, the device contains at least one calender through which the band can be guided for levelling and smoothing the layers provided by the liquid supply systems.

25 The calender contains two rollers and means for driving at least one of these rollers, such that the one roller turns at a higher peripheral velocity than the other one.

30 Preferably, the heating means contain two rotating, heated drums over which the band is guided, whereby at least the second liquid supply system is erected opposite to this pair of drums.

35 The two drums may have converging axes, such that the band automatically advances towards the end where the axes are

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situated closest to one another when the band is guided over these drums.

In order to better explain the characteristics of the invention, the following preferred embodiments of a method and a device for applying a reflecting material on a substrate according to the invention are described as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 schematically represents a side view of a device for applying a strip of reflecting material on a band according to the invention;

figure 2 schematically represents a top view of the device of figure 1;

figures 3 and 4 represent the parts indicated by F3 and F4 in figure 1 to a larger scale;

figures 5 to 7 also represent the parts indicated by F5, F6 and F7 respectively in figure 2 to a larger scale;

figure 8 represents a part analogous to that in figure 3, but with reference to another embodiment of the invention;

figure 9 represents the part analogous to that in figure 8, but with reference to yet another embodiment.

In order to apply a reflecting material according to the invention, two layers are successively provided on a substrate, formed of a basic fabric in the given example, woven with a fine structure and made of UV-resistant synthetic material, in particular polyester.

The first layer is made of a polymer solution, consisting of acrylic polyurethane or acrylic vinyl acetate on an

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aqueous base onto which have been added one or several pigments, in particular colour pigments and/or metal pigments.

- 5 According to a variant, the pigments may entirely or partly consist of a phosphor or fluorescent material in case the reflecting strip also has to be phosphorescent or fluorescent.
- 10 This polymer solution is spread over the fabric in the required proportions, for example by immersion, by means of a nozzle, by means of a vibrating roller or by means of a spreader.
- 15 This basic layer is subsequently dried, which can be accelerated by heating it.

The second layer, which is preferably only provided after the first one has dried, is transparent and consists of

20 light-reflecting particles, in particular glass beads, in a transparent base consisting of resin, polyurethane, polyvinyl chloride, acrylic or such on an aqueous base.

This layer is dried and chemically stabilised, after which

25 the entire coating provided on the fabric is levelled and smoothed by rolling said fabric with the two layers between two rollers, whereby the roller which makes contact with the coating is preferably driven at a higher peripheral velocity than the other one.

30

Immediately after the second layer has been applied, before it is dried, the substrate with the two layers may be exposed to ultrasonic vibrations, as a result of which the light-reflecting particles will emerge on the surface of

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the second layer, which results in a larger reflection of reflecting material.

5 The above-described method is particularly suitable for applying a strip of reflecting material on a woven band, whereby the layers can be applied, dried and levelled while the band is unrolled from one roller and rolled up on another one.

10 Figures 1 to 7 represent a device which is designed for applying a strip on a band in such a way.

15 This device mainly consists of a frame 1, a feed mechanism 2 for a woven band 3, two liquid supply systems formed of nozzles 4 and 5 for applying the two above-mentioned layers, means consisting of two internally heated drums 6 and 7 for heating the band 3 beyond each nozzle 4 and 5, a cooling part 8, a calender 9 and a roll-up mechanism 10.

20 The feed mechanism 2 consists of a roller holder 11 for a spool 12 upon which the band 3 is wound, and two guide rollers 13 and 14 which are pressed against one another and which are mounted such on the frame 1 that they turn loosely.

25 The two drums 6 and 7, which are significantly longer than the width of the band 3, are bearing-mounted in the frame 1, such that they extend in the cross direction of the device and are situated opposite to the feed mechanism 2
30 with one end.

As is represented in figure 2, the axes of the two drums 6 and 7 are not parallel to one another, by they converge towards their other end.

35

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These drums 6 and 7 are hollow and can be heated by means of for example hot air or steam which is led through it.

5 The nozzle 4 is fixed on the frame 1 above the path of the band 3 between said feed mechanism 2 and the first drum 6, opposite one end of this drum 6, and in the given example it has a nozzle opening which is narrower than the band 3.

10 The nozzle 5 is identical, but it is attached to the frame 1 practically halfway down the length of this drum 6 above the path of the band 3.

15 The cooling part 8 consists of a number of conductors, for example capstans 15, for the band 3 which are fixed to the frame 1 alternately above and beneath it and shifted in the cross direction of the device.

20 The calender 9 consists of two rollers 16 and 17 provided on top of one another on the frame 1. One of the rollers, i.e. the top roller 16 in the given example, is driven by an electric motor 18 as represented in figures 1 and 7. The other roller 17 is driven via a transmission 19, as represented in figure 4, such that its peripheral velocity is lower.

25 The calender 9 also forms the transport device of the band 3.

30 The roll-up mechanism 10 consists of a roller holder 20 for a spool 12 upon which the band 3 can be wound. This spool 12 can be locked on the shaft 21 of the roller holder 20, which is then driven by the above-mentioned motor 18, for example via a transmission 22.

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A roller with band 3 is placed on the roller holder 11, and the band 3 is provided between the guide rollers 13 and 14, guided several times around the two drums 6 and 7 as a whole, up and down over the capstans 15 of the cooling part 8 and finally through the calender 9 up to the spool 12 of the roll-up mechanism.

The heating of the drums 6 and 7 is turned on, the motor 18 is activated and the nozzles 4 and 5 are fed with the material for forming the two layers.

The band 3 is transported through the calender 9 and wound on the spool 12 of the roll-up mechanism.

The above-mentioned polymer solution is squirted as a first layer 23 in the shape of a continuous strip on the band 3 by the first nozzle 4, as is represented in detail in figure 5.

This paste is dried on the heated drums 6 and 7.

As the axes of these drums 6 and 7 converge, successive windings of the band 3 around these drums 6 and 7 will automatically advance towards the end where the axes are situated closest to one another.

By the time the material squirted on the band 3 reaches the nozzle 5, it is dry. A second layer 24 of the above-mentioned material with reflecting particles is then squirted on the first layer 23 by the nozzle 5 in the shape of a strip having for example the same width.

When this material reaches the end of the drums 6 and 7, it is dry.

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The band 3 with the layers 23 and 24 on top of one another is still warm, but it is cooled by the air as it follows its path up and down in the cooling part 8.

- 5 The layers 23 and 24 are levelled and smoothened by the calender 9.

The above-described method is simple and versatile.

- 10 According to a variant, the band 3 with the two layers 23 and 24 is exposed to ultrasonic vibrations immediately beyond the nozzle 5, and thus while the layer 24 is still wet.

- 15 To this end, as is represented in figure 8, the device contains a plate 25 beyond the drum 6, on whose bottom is provided a generator of ultrasonic vibrations 26.

- 20 Thanks to the ultrasonic generator 26, the light-reflecting particles, for example the glass beads in the layer 24, will be carried to the surface, as a result of which a larger quantity of such particles will be situated on the surface, so that the reflecting qualities are improved.

- 25 The nozzle 5 for the squirting of the second layer 24 is fed with light-reflecting particles in a transparent base from a reservoir 27 via a pipe 28 in which is mounted a pump 29.

- 30 For clarity's sake, this reservoir 27 and this pipe 28 and pump 29 are not represented in figures 1 to 7.

- On the side wall of the reservoir 27 may also be fixed, as represented in figure 8, a generator of ultrasonic
35 vibrations 30.

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Thanks to these ultrasonic vibrations, the reflecting particles will not deposit in the resin of the transparent base in the reservoir, but they will remain evenly
5 distributed in this resin.

Also the nozzle 4 is connected to a reservoir 33 via a pipe 31 containing a pump 32. On this reservoir could be provided a generator of ultrasonic vibrations as well, for
10 example in order to prevent the pigments from depositing in the polymer solution in this reservoir 33, but this is usually not necessary.

Said polymer solution and said resin with light-reflecting
15 particles must not necessarily be provided by means of a nozzle 4 or 5. Other liquid supply systems, for example with rollers, are possible.

Figure 9 represents a vibrating roller system which is used
20 as an alternative to the nozzle 5, but naturally such a system may also replace the nozzle 4.

The band 3 is guided over guide rollers 34 over a vibrating roller 35 which makes contact with a wetting roller 36
25 which is partially immersed in a reservoir 37 containing the polymer solution or the resin with light-reflecting particles. Also on this reservoir 37 can be provided a generator for ultrasonic vibrations 26 as represented in figure 9.

30 The width of the band 3 or of the layers 23 and 24 can be easily adjusted. Thus, the layers 23 and 24 may cover the entire width of the band 3.

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The strip with the two layers 23-24 adheres very strongly to the band 3 and has excellent reflecting and possibly also phosphorescent qualities.

- 5 The band 3 can also be made of plastic foil instead of fabric.

10 The invention is by no means limited to the above-described embodiments represented in the accompanying drawings; on the contrary, such a method and device for the application of reflecting material on a substrate can be made in all sorts of variants while still remaining within the scope of the invention.

Claims.

5 1. Method for the application of reflecting material on a substrate, in particular of a reflecting strip on a band (3), characterised in that on the place where the reflecting material is to be provided, a layer (23) of a polymer solution with at least one pigment and a second
10 layer (24) with light-reflecting particles are applied on the substrate.

2. Method according to claim 1, characterised in that the second layer (24) is provided in a liquid form after the
15 first layer (23) has dried.

3. Method according to claim 1 or 2, characterised in that, after the second layer (24) has dried, the two layers (23 and 24) are levelled under pressure.

20 4. Method according to any of claims 1 to 3, characterised in that the second layer (24) is exposed to ultrasonic vibrations while it is still wet.

25 5. Method according to any of claims 1 to 4, characterised in that the substrate is a band (3), in particular a fabric, and in that the reflecting material is provided on it as a strip.

30 6. Method according to claim 5, characterised in that the strip (23-24) is provided on a band (3) made of a polyester fabric.

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7. Method according to claims 3 and 5, characterised in that the two layers (23 and 24) are levelled by calendering the whole of the substrate and the layers (23 and 24).

5 8. Method according to claim 7, characterised in that the calendering takes place between two rollers (16 and 17), whereby the roller (16) situated on the side of the layers (23 and 24) is driven at a higher peripheral velocity than the other one.

10

9. Method according to claim 2 or 3, characterised in that in order to accelerate the drying of an applied layer (23 or 24), this layer (23 or 24) is heated.

15 10. Method according to claims 2 and 9, characterised in that the first layer (23) is heated before it is dried, but is first cooled before the second layer (24) is provided.

11. Method according to claims 3 and 9, characterised in
20 that the second layer (24) is heated before it is dried and is cooled before it is levelled.

12. Method according to any of the preceding claims, characterised in that the first layer (23) is an acrylic
25 polyurethane or an acrylic vinyl acetate on an aqueous base onto which pigment has been added.

13. Method according to any of the preceding claims, characterised in that the second layer (24) is a
30 transparent layer consisting of a resin with reflecting particles added to it, in particular glass beads.

14. Device for applying a strip (23-24) of reflecting material on a band (3), which device contains two liquid
35 supply systems (4 and 5), means for successively moving a

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band (3) in relation to said two liquid supply systems (4 and 5) and heating means for heating the band (3) beyond each liquid supply system (4-5).

5 15. Device according to claim 14, characterised in that it contains at least one calender (9) through which the band (3) can be guided for levelling and smoothing the layers (23-24) provided by the liquid supply systems (4-5).

10 16. Device according to claim 15, characterised in that the calender (9) contains two rollers (16 and 17) and means for driving at least one of these rollers (16-17), such that one roller turns at a higher peripheral velocity than the other one.

15 17. Device according to any of claims 14 to 16, characterised in that the heating means contain two rotating, heated drums (6 and 7) over which the band (3) is guided, whereby at least the second liquid supply system
20 (5) is erected opposite to this pair of drums (6 and 7).

18. Device according to claim 17, characterised in that the two drums (6 and 7) have converging axes, such that the band (3) automatically advances towards the end where the
25 axes are situated closest to one another when it is guided over these drums (6 and 7).

19. Device according to claim 15, characterised in that it contains a cooling part (18) in between the heating means
30 and the calender (9) which consists of conductors (15) for the band (3) which are situated alternately at the top and at the bottom.

20. Device according to any of claims 14 to 19,
35 characterised in that it contains a plate (25) beyond the

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second liquid supply system (5) upon which is provided a generator of ultrasonic vibrations (26).

21. Device according to any of claims 14 to 20,
5 characterised in that the second liquid supply system (5) contains a reservoir (27;37) upon which is provided a generator of ultrasonic vibrations (26).

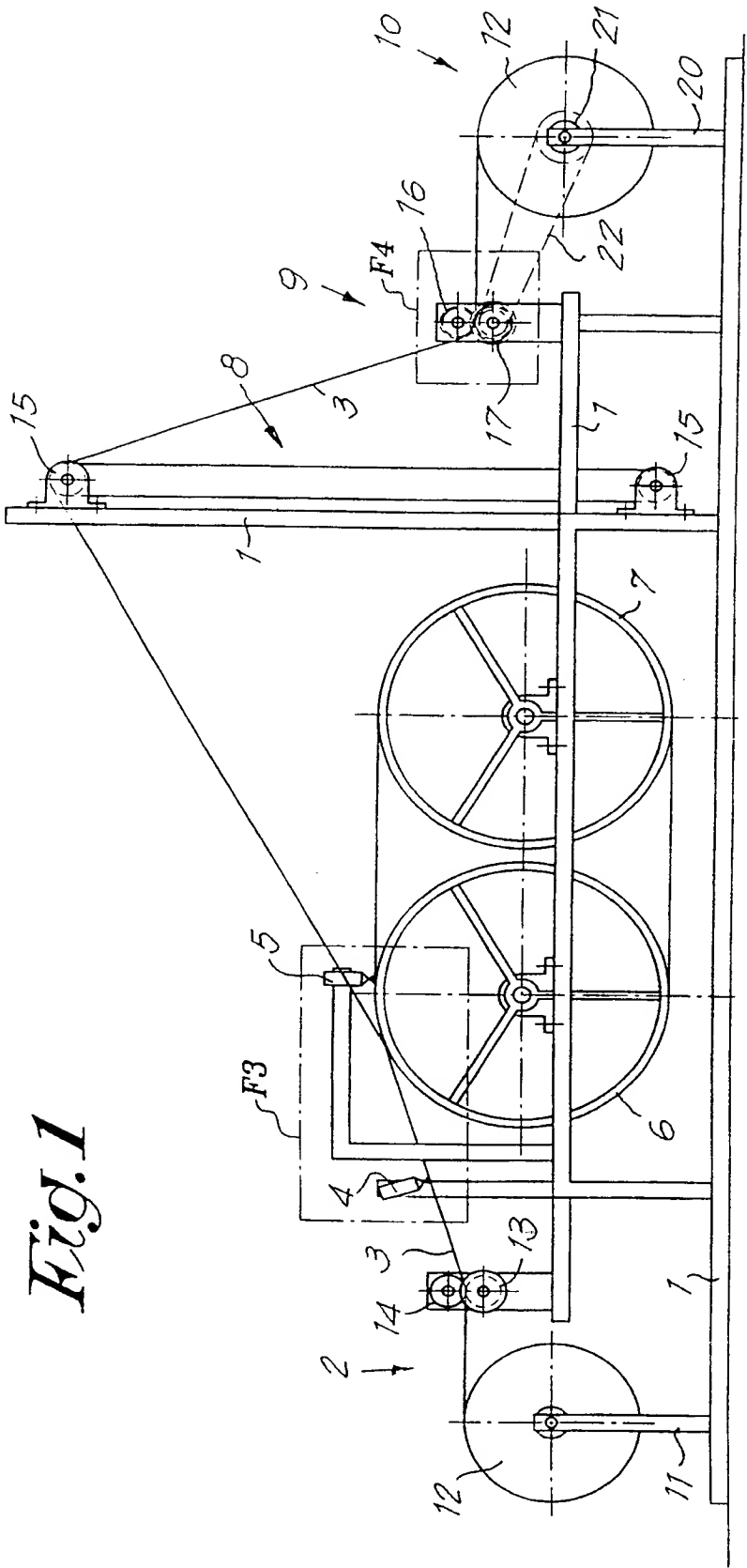


Fig. 1

Fig. 2

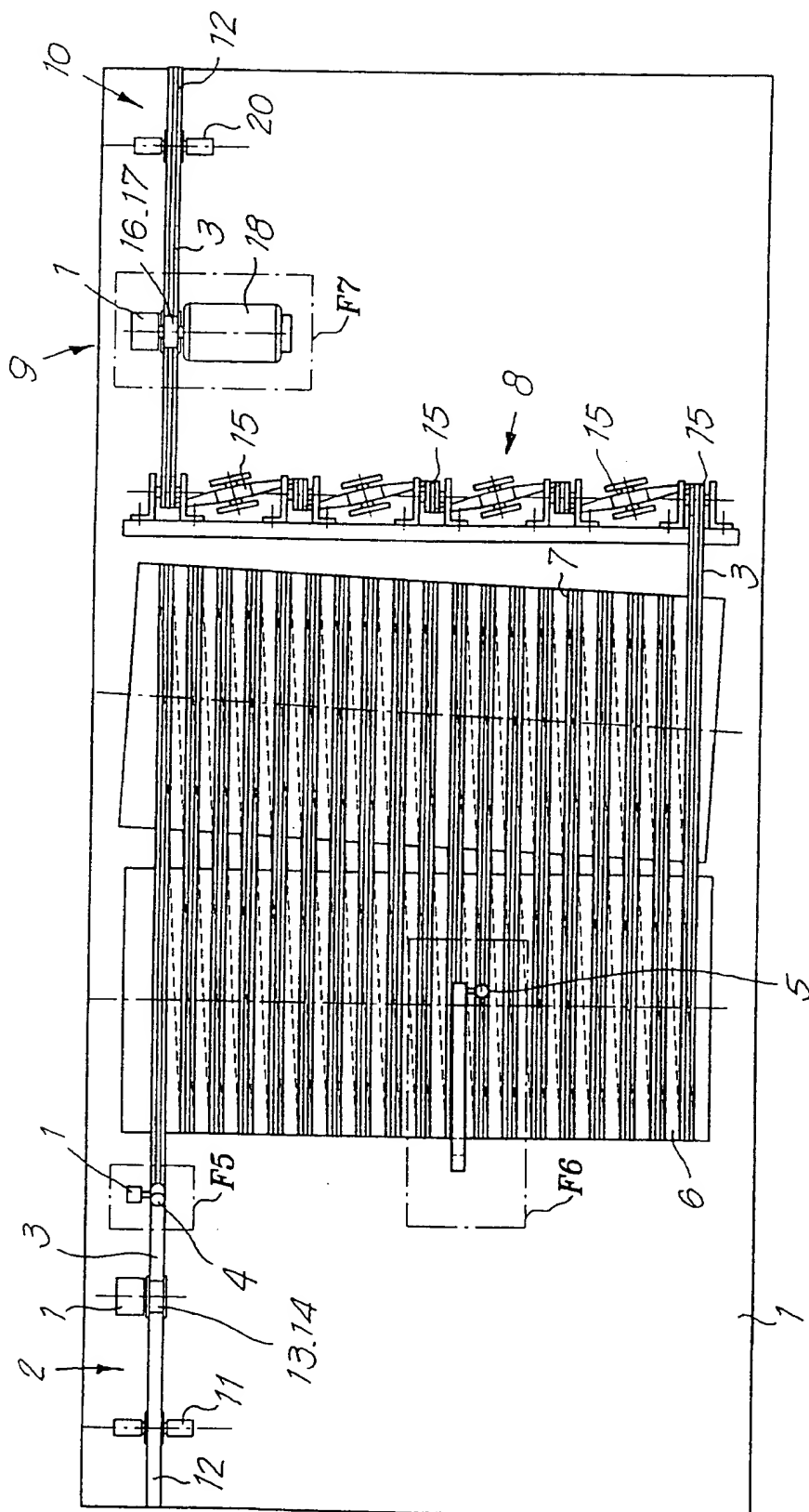


Fig.3

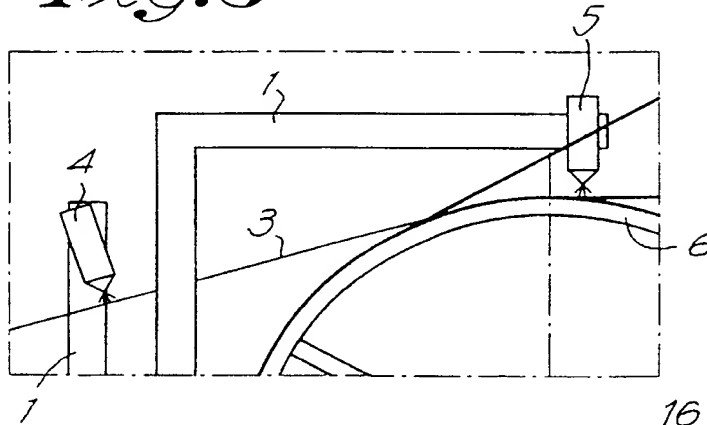


Fig.4

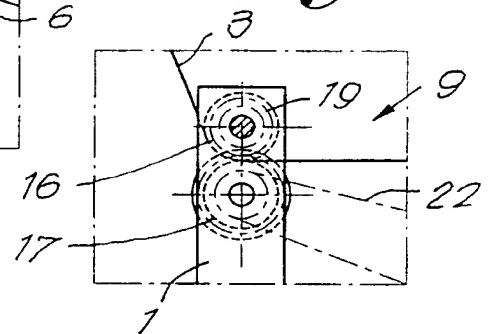


Fig.5

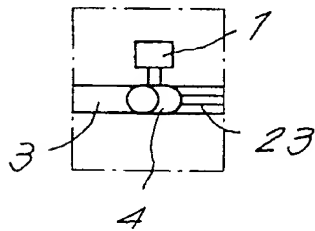
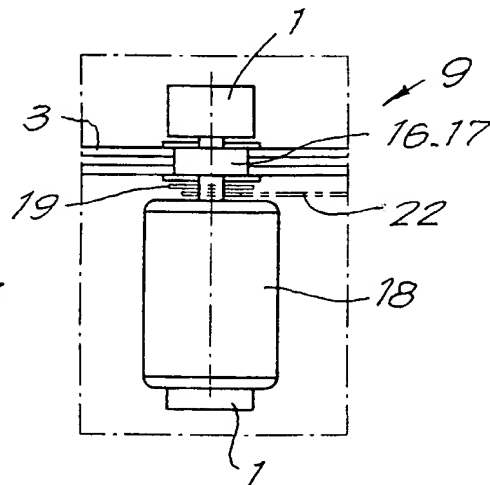
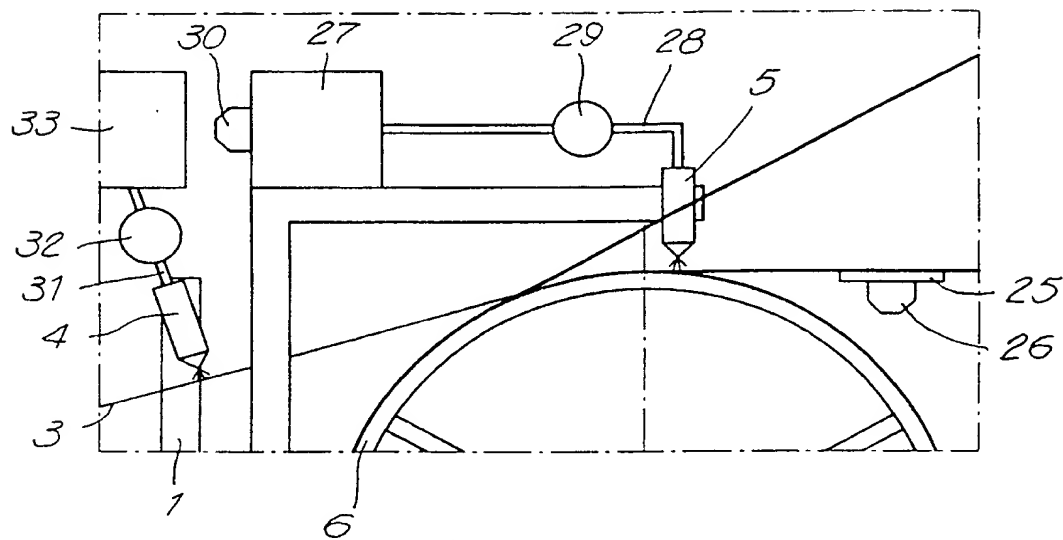
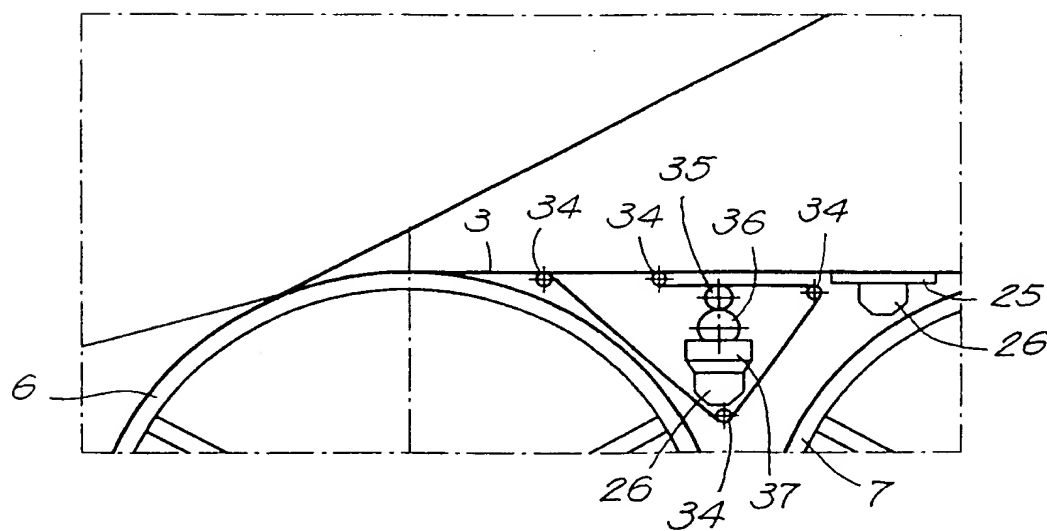


Fig.6

Fig.7



*Fig. 8**Fig. 9*

INTERNATIONAL SEARCH REPORT

Int.: onal Application No

PCT/BE 99/00159

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 D06N3/00 D06N3/18 D06Q1/00 B05D5/06 G02B5/128

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D06N B05D G02B D06Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	abstract — — — — — — / — —	12

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

18 February 2000

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Inte: Final Application No

PCT/BE 99/00159

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
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